MACHINE SYSTEM HAVING COOLER WITH PACK SEAL AND HEADER ASSEMBLY FOR SAME

TECHNICAL FIELD

[0001] The present disclosure relates generally to a cooler in a machine system, and more particularly to a cooler having a cooling tube supported in a header and a pack seal squeezed into sealing contact with the cooling tube and the header.

BACKGROUND

[0002] Many machine systems employ some form of active cooling of the equipment that utilizes air or dedicated coolant fluids. In the context of construction, mining, and agricultural machinery, for example, coolers are employed in well-known configurations for cooling engine oil, radiator fluid, transmission fluid, exhaust gases, and intake air. Intake air that is compressed in a turbocharger for feeding to an internal combustion engine, for example, can often be increased in temperature by several hundred degrees. While engines can be operated on hot pressurized intake air, in many instances it is desirable to cool pressurized intake air to increase its density.

[0003] A device known as an aftercooler, commonly air cooled, is arranged in an engine intake system fluidly between a compressor and an intake manifold in many designs. Aftercoolers, and cooling equipment generally, can be subjected to harsh conditions in many common machinery applications. For example, off-highway trucks and other equipment can operate upon rough terrain and subject cooling equipment such as aftercoolers to shocks, vibrations, and other mechanical stresses, with the equipment also experiencing extremes of temperature and wide temperature swings. As a result, aftercoolers and the like sometimes experience damage or performance degradation prior to the end of an intended service life. One example aftercooler used in a machinery application is set forth in U.S. Pat. No. 6,318,347 to Dicke et al.

SUMMARY OF THE INVENTION

[0004] In one aspect, a machine system includes a compressor having an air inlet, and a compressed air outlet. The machine system further includes a cooler having an inlet tank, a header attached to the inlet tank, and having an inlet header side and a second header side opposite to the inlet header side, and a cooling tube. The cooling tube includes an inlet tube end supported in the header and opening to the inlet tank and an outlet tube end arranged to feed cooled air to a machine in the machine system, and the cooling tube having at least one external heat exchange surface exposed to a flow of cooling air between the inlet tube end and the outlet tube end. The cooler further includes a pack seal extending peripherally around the cooling tube, and a clamping assembly coupled to the second header side and clamping the pack seal against the header, such that the pack seal is squeezed into sealing contact with each of the cooling tube and the header.

[0005] In another aspect, an air-to-air aftercooler (ATAAC) for an intake system in an internal combustion engine includes an inlet tank having a compressed air inlet, and an outlet tank having a cooled air outlet. The ATAAC further includes a header attached to the inlet tank and having an inlet header side, and a second header side opposite to the inlet header side, and a cooling tube having an inlet tube end supported in the header and opening to the inlet tank and an outlet tube end opening to the outlet tank. The cooling tube includes at least one heat exchange surface exposed to a flow of cooling air between the inlet tube end and the outlet tube end. The ATAAC further includes a pack seal extending peripherally around the cooling tube, and a clamping assembly coupled to the second header side and clamping the pack seal against the header, such that the pack seal is squeezed into sealing contact with each of the cooling tube and the header.

[0006] In still another aspect, a header assembly for an air-to-air aftercooler (ATAAC) includes a header having an inlet header side structured for coupling with an inlet tank, and a second header side opposite to the inlet header side, a plurality of tube openings extending between the inlet header side and the second header side, and a plurality of seal cavities in communication with the plurality of tube openings. The header assembly further includes a plurality of cooling tubes supported in the header within the plurality of tube openings, a plurality of pack seals positioned within the plurality of seal cavities, and a clamping assembly coupled to the second header side and clamping the plurality of pack seals against the header, such that the plurality of pack seals are squeezed into sealing contact with the plurality of cooling tubes and the header.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is diagrammatic view of a machine system, according to one embodiment;

[0008] FIG. **2** is a disassembled view of a header assembly, according to one embodiment;

[0009] FIG. **3** is an assembled view of a header assembly, according to one embodiment;

[0010] FIG. **4** is a sectioned view through a header assembly, according to one embodiment; and

[0011] FIG. **5** is another sectioned view through a header assembly, according to one embodiment.

DETAILED DESCRIPTION

[0012] Referring to FIG. **1**, there is shown a machine system **10** according to one embodiment and including a machine **12** having a machine housing **15**, an intake system **14** for machine **12**, and an exhaust system **16**. Machine **12** may be an internal combustion engine where machine housing **15** includes an engine housing or cylinder block, having a plurality of combustion cylinders **17** formed therein. In one such engine implementation, machine **12** includes a direct-injected compression-ignition diesel engine structured to operate on a diesel distillate fuel, for example. Intake system **14** may thus include an engine air intake system, with exhaust system **16** including an engine exhaust system. Intake system **14** can deliver air, or mixtures of air, exhaust, and potentially a gaseous fuel such as natural gas, to cylinders **17** for combustion in a generally known manner. Intake system **14** includes an air filter **24**, a compressor **20**, a cooler **40**, and potentially other apparatus for pressurizing, cooling, and conveying air to be delivered to machine **12**. Exhaust system **16** may include a turbine **22** and one or more aftertreatment devices **26** in a generally known configuration and for generally known purposes. Compressor **20** and turbine **22** may be parts of a turbo-